NEW RECORDS OF *ALLOCAPNIA* (PLECOPTERA: CAPNIIDAE) FROM MISSISSIPPI AND LOUISIANA, WITH ACCOMPANYING SCANNING ELECTRON MICROGRAPHS[1]

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ABSTRACT: Seventy-one sites were surveyed for *Allocapnia* (Plecoptera: Capniidae) in southwestern Mississippi and three of the Florida parishes of Louisiana. These surveys extended over six major river drainages. New records of *A. virginiana, A. recta,* and *A. aurora* are reported, and scanning electron micrographs of the male genitalia are provided for each species.

Small winter stoneflies (Capniidae) constitute the largest family of Plecoptera in North America (Borror, Triplehorn, and Johnson 1989). They have captivated curious minds at least since the mid-nineteenth century (Frison 1929) because they are generally less than 10 mm in length and, unlike most other insects, emerge as adults during the winter or early spring (Ross and Ricker 1971). Most capniids in eastern North America belong to the genus *Allocapnia* Claassen (Borror, Triplehorn, and Johnson 1989). *Allocapnia* is typical of the Capniidae and is distinguished from the other genera of the family by the presence of a straight R_1 of the fore wing just beyond the origin of R_S (Stewart and Harper 1996) and by the presence of a dorsal process on the eighth tergite and a double epiproct in males (Ross and Ricker 1971). Differentiation of species is chiefly based on characteristics of the male genitalia.

METHODS

Adult *Allocapnia* were collected from December 1996 to February 1997 by hand from bridges and by rod and beating sheet from streamside plants. Nymphs were collected by browsing through leaf litter in streams. Specimens were killed and stored in 80% ethanol and were examined and identified using a dissecting microscope. The genitalia of representative male samples were then viewed using an AMRAY 1810D scanning electron microscope and photographed. Specimens were deposited in the entomological collection of B. P. Stark at Mississippi College.

Forty-eight sites were surveyed in the southwestern Mississippi counties of Amite, Franklin, Lincoln, Pike, Walthall, and Wilkinson. Twenty-three sites were surveyed in three of the Florida parishes of Louisiana, namely, East Feliciana, St. Helena, and West Feliciana. The Florida parishes of Louisiana

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are those that occur in the southeastern part of the state east of the Mississippi River. The surveys included collection sites from the Amite River, Bogue Chitto River, Buffalo River, and Homochitto River drainages in Mississippi and the Bayou Sara and Thompson Creek drainages in Louisiana. Also, one small stream in Mississippi and two small streams in Louisiana which flow directly into the Mississippi River were surveyed (Fig. 1).

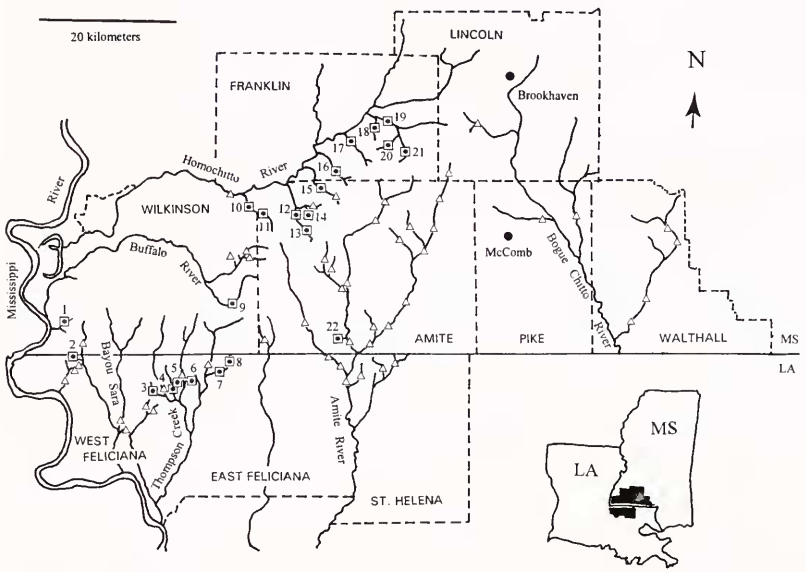

Fig. 1. Map of the study area: southwest Mississippi and three of the Florida parishes of Louisiana. Sites with *Allocapnia* records in the winter of 1996-1997 are indicated by a ⊡ and negative records are indicated by a Δ. Numbered collection sites are further described in the text.

RESULTS AND DISCUSSION

Fig. 1 is a summary map of the sample localities. Sites with *Allocapnia* are numbered as follows:

1. Wilkinson Co., MS, Clark Cr., Clark Cr. Natural Area, *A. recta.*
2. West Feliciana P., LA, Kimball Cr. at Pinckneyville Rd., unresolved ♀ (likely *A. recta).*
3. West Feliciana P., LA, Dry Cr. at LA 421, *A. recta.*
4. West Feliciana P., LA, Mill Cr. at LA 421, *A. recta.*
5. West Feliciana P., LA, Thom Cr. at LA 421, *A. recta.*
6. West Feliciana P., LA, un-named tributary to Middle Fork Thompson Cr. at LA 421,unresolved ♀ (likely *A. recta).*

7. East Feliciana P., LA, Hurricane Cr. at Thompson Cr. Rd., *A. recta, A. virginiana.*
8. East Feliciana P., LA, Shady Grove Branch at Thompson Cr. Rd., *A. recta, A. virginiana.*
9. Wilkinson Co., MS, Buffalo R. at Hiram McGraw Rd., *A. recta, A. virginiana.*
10. Amite and Wilkinson Co., MS, Foster Cr. at MS 33, nymph.
11. Amite Co., MS, Foster Cr. at MS 33, *A. aurora, A. virginiana.*
12. Amite Co., MS, Brushy Cr. at Cobb Rd., *A. virginiana.*
13. Amite Co., MS, Brushy Cr. at New Hope Rd., *A. virginiana.*
14. Amite Co., MS, un-named tributary to Birdman Branch at Fox Rd., *A. recta.*
15. Amite Co., MS, Caston Cr. at Oxford-Meadville Rd., *A. virginiana.*
16. Franklin Co., MS, Middleton Cr. at USFS 100, *A. virginiana.*
17. Franklin Co., MS, Porter Cr. at USFS 108, *A. recta, A. virginiana.*
18. Franklin Co., MS, Dry Cr. at USFS 145, *A. aurora, A. recta, A. virginiana.*
19. Franklin Co., MS, McGehee Cr. at low-water bridge, *A. virginiana.*
20. Franklin Co., MS, Cane Mill Branch near Little Springs, *A. aurora, A. virginiana.*
21. Franklin Co., MS, Goober Cr. at Little Springs, *A. virginiana.*
22. Amite Co., MS, un-named tributary to West Fork Amite River, *A. recta.*

Of the seventy-one surveyed sites, twenty-two (31%) yielded at least one specimen of *Allocapnia*. The majority of these sites (82%) occur in the Homochitto River drainage of Mississippi and the Thompson Creek drainage of Louisiana. No specimens of *Allocapnia* were collected from the Bogue Chitto River drainage. Specimens were collected from one site in the Amite River drainage, one site in the Buffalo River drainage, one site in the Bayou Sara drainage, and one site from a stream which flows directly into the Mississippi River.

Overall, 188 adults (151♂, 37♀) and 14 nymphs were collected. Of the identifiable specimens (some dehydrated individuals were collected from spider webs and some females could not be resolved), 84 (56%) belonged to *Allocapnia virginiana* Frison, 62 (41%) to *A. recta* (Claassen) Frison, and 4 (3%) to *A. aurora* Ricker. Scanning electron micrographs are provided in Figs. 2-7. *A. virginiana* (Figs. 2-3) is characterized by a large apical segment of the upper limb of the epiproct and by a wide but short dorsal process with a small anterior process. *A. recta* (Figs. 4-5) is characterized by a long, thin apical segment and a dorsal process with a semicircular apical ridge. *A. aurora* (Figs. 6-7) is characterized by a slender apical segment and a dorsal process with widely separated lobes.

Although the data imply a paucity of *Allocapnia* outside of the Homochitto River and Thompson Creek drainages, this is somewhat misleading. Two of the three streams which flow directly into the Mississippi River probably did not produce *Allocapnia* individuals because occasional inundation from the Mississippi River hinders nymphal establishment. The Bayou Sara drainage experiences similar effects from the Mississippi River. Clark Creek, on the other hand, has several high waterfalls in the loess bluffs region and is protected from periodic flooding and backwater.

The Buffalo River probably has more *Allocapnia* than reported. Of the four sites investigated, three fall within company timberland, where the streams have litter composed primarily of pine straw. The Amite River and Bogue Chitto

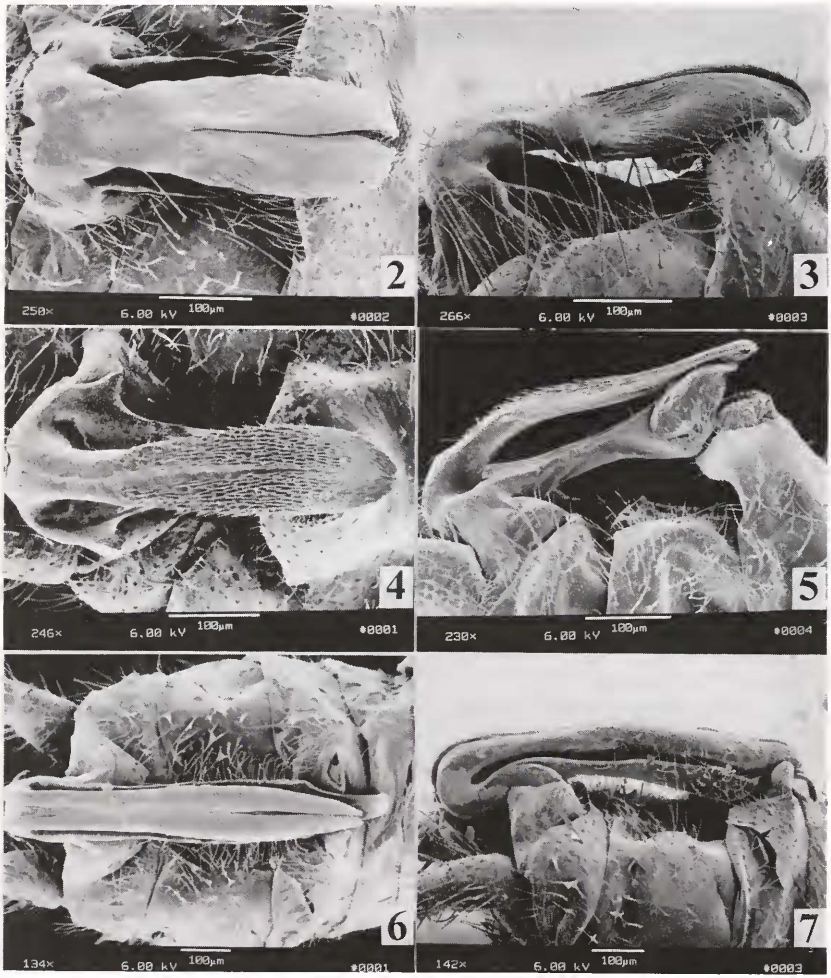

Fig. 2. *Allocapnia virginiana* epiproct, dorsal aspect.

Fig. 3. *Allocapnia virginiana* epiproct, lateral aspect.

Fig. 4. *Allocapnia recta* epiproct, dorsal aspect.

Fig. 5. *Allocapnia recta* epiproct, lateral aspect.

Fig. 6. *Allocapnia aurora* epiproct, dorsal aspect.

Fig. 7. *Allocapnia aurora* epiproct, lateral aspect.

River, however, are somewhat different. Whereas the previous drainages consist primarily of fast-flowing, shallow, sandy streams, the Amite River and Bogue Chitto River drainages consist of deep, slow-flowing, mixed gravel-silt streams. The single record from the Amite River drainage indicates that *Allocapnia* are present and suggests that they are probably limited to localized populations where stream habitat is suitable. Further searches in the Bogue Chitto River drainage are necessary to determine the presence or absence of *Allocapnia* there.

These data indicate a wide distribution of both *A. recta* and *A. virginiana*. *A. recta* appears to predominate in Louisiana while *A. virginiana* appears to predominate in the hilly Homochitto drainage of Mississippi. This apparent discrepancy, however, may be due to collection and emergence timing. B. P. Stark (pers. comm.) has previously collected both species in central Mississippi and *A. virginiana* in the Homochitto drainage. Ross and Ricker (1971) report neither species in Louisiana or southwest Mississippi, but this may be due to little or no sampling in the area. They do, however, report collections of *A. virginiana* from eastern Mississippi and note the abundance of *A. recta* in the Coastal Plain (Ross and Ricker 1971).

Allocapnia aurora was only found in the Homochitto drainage in a few disjunct locations. Stark (pers. comm.) has not collected *A. aurora* southwest of Tishomingo Co., MS, despite intensive collecting in central Mississippi, and Ross and Ricker (1971) report it no farther west than southwestern Alabama. This interesting anomaly of distribution could be the result of dispersal via the Pliocene Tennessee River entering the retreating Mississippi Embayment near southwest Mississippi during a glacial advance. Stern (1976) provides evidence for such an event based on unionid mussel distributions and sums up the geologic evidence. Why no *A. aurora* occur between southwest Mississippi and the southern Appalachians or southwestern Alabama, nevertheless, remains unclear. Regardless, because distributional information is often integrated with phylogeny to construct hypothetical dispersal paths and to speculate about selection pressures, these new records are valuable to an accurate evolutionary understanding of *Allocapnia*.

ACKNOWLEDGMENTS

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BOOK REVIEW

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given genera and species is not so transparent (the indices ameliorate the problem to a considerable extent, however). It should be noted that the classification of Odonata at the level of subfamilies and tribes is currently not very well-founded and is in a state of flux, although this is certainly no fault of either author.

In general, the Steinmann volumes use a much more traditional format, so entomologists accustomed to using catalogs for other groups may feel more at home with them, but I have found that, with a little initial effort, Bridges' catalog is extremely easy to use and provides a number of advantages over the common approach. On the other hand, Steinmann certainly is physically easier to use, as it is printed as two compact volumes, while Bridges is a rather unwieldy tome. Steinmann also provides a slightly more extensive synonymy, and the full references appear with the species to which they pertain, whereas Bridges' citations are numerically coded and the full references appear only in the bibliography. The latter is by far the more extensive and up-to-date, however, with over 6500 entries, and it is accompanied by indices that allow cross-referencing by author and journal. This in itself is an outstandingly useful reference. Bridges provides no indication of range nor does he include diagnoses of any taxa, but the last edition does contain an appendix with figures of wings of most genera.

The major failing of Steinmann's *World Catalog*, especially compared to Bridges', however, is that it simply is not current. It has used Davies and Tobin (1984, 1985) as its starting point, but, although it has added substantially to their work, it has not moved beyond that as it could and should have. Despite considerable, and accelerating, work on the taxonomy of the Odonata over the last decade, almost no species described after 1990 are included here. Also missed were, e.g., Lohmann's (1992) revision of the Cordulegastridae, and the major reanalysis by Carle and Louton (1994) separating a new family, the Austropetaliidae, from the now monotypic Neopetaliidae, with a radically new understanding of the position of the latter. Thus, despite the 1997 publication date, this catalog lags considerably behind Bridges' 1994 edition. Coupled with its astronomical price (over $850 at current exchange rates), this makes it hard to recommend as a practical tool for the study of Odonata, despite its several useful features.

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